ELECTRICAL SCIENCE.

Execution by Electricity.

IN view of the new law of the State of New York, doing away with hanging, and the substitution of electricity as the means of execution, a committee was appointed by the Medico-Legal Society to consider the best method of carrying the law into effect. The committee consisted of Dr. Frederick Peterson, Dr. J. Mount Bleyet, R. Ogden Doremus, and Dr. Frank H. Ingram. The committee submitted its report on the 14th inst.

The committee first mentions the experiments made by the commission appointed by the governor to examine into the various methods of causing death. These experiments consisted in placing dogs in a zinc-lined box, partly filled with water, one pole of the dynamo being the coating of the box, the other being a wire wound around the dog's nose or inserted in his mouth. Death was certain and instantaneous, but no data were obtained as to the potentials or currents used. During the summer, experiments were carried out at the Edison laboratory on a number of dogs; and it was shown that an alternating current of 160 volts was sufficient to kill a dog, and that with a continuous current a much higher voltage was necessary. The report proceeds as follows: —

"The average resistance of the human body is about 2,500 ohms. The most of this resistance is in the skin. It is evident, therefore, that the larger the surface of the electrode applied to the body, the greater will be the resistance. It is also a fact that the density of the current depends upon the superficial area of the electrode. A pole of small diameter will hence meet with less resistance, the passing current will be more intense, and the resulting current strength will be greater, than when an electrode of large sectional area is employed."

These statements are not correct; but, before referring to them further, we will summarize the rest of the report. The committee goes on to state that "there can be no doubt that one electrode should be in contact with the head," and recommends that the other be placed in the neighborhood of the spine. To practically carry this out, it proposes that a helmet, containing one electrode, be fitted on the head of the criminal, and he be bound to a table or in a chair, the other electrode fitted so it will impinge on the spine between the shoulders. "The electrodes should be of metal, not over an inch in diameter, somewhat ovoidal in shape, and covered with a thick layer of sponge or chamois-skin. The poles, and the skin and hair at the points of contact, should be thoroughly wetted with warm water. The hair should be cut short." An electromotive force of not less than 3,000 volts should be used, preferably alternating.

In criticism of this report, it should be remarked, in the first place, that the statement, that, because the greatest resistance of the human body is in the skin, "the larger the surface of the electrode applied to the body, the greater the resistance," is directly opposed to fact. The larger the electrode, the *smaller* will be the resistance, and this fact would point to a comparatively large electrode being used.

Again: it is not evident that one of the poles should be applied to the head. It is probable that very little of the current would penetrate the skull and pass through the brain, and that the greater part would pass through the tissues between the skin and the bone. It is probable that a current passing from one arm to another, traversing the vicinity of the heart, would be much more certain in its action than by the plan proposed, with the additional advantage that it is very easy to make contact with the arms. In almost, if not all, the fatal accidents that have occurred, the current has passed in this manner; and by insuring good contacts, and employing 3,000 volts, the results would be reasonably certain. As for the current through the head, we have no data as to the effects produced.

Finally, if the criminal is to be executed according to the plan proposed, the electrodes should be moistened with acidulated or salt water, not simply warm water. The only good feature of the report is in the potential recommended. An alternating current of 3,000 volts would in all probability kill the criminal, however it happened to be introduced.

A SNOW-STORM ON AN ELECTRIC ROAD. — On Friday, Nov. 9, St. Joseph, Mo., was visited by one of the most severe snow-storms in the history of the city. According to the *Daily Gazette*, "the big storm completely paralyzed business, and shut this section of the country off from communication with the world. The snow which fell was of the damp variety, and at 2 o'clock in the afternoon the loaded telegraph and telephone wires began to break under the pressure. Then the heavy electric-light wires began to fall, and at 4 P.M. every thing was demoralized. Many telephones were burnt out, and the entire system of the city was rendered practically useless." Speaking of the cars on the Sprague Electric Street-Railroad, the *Gazette* continues, "There were present all the conditions which it was feared might impair the usefulness of the new motor, but not the least inconvenience or delay resulted. With the use of two-fifths the capacity of the plant, the usual number of cars were operated, and made the usual time. And not only did the storm illustrate the reliability of the electric motor, it also showed that the Union Passenger Railroad line people made no mistakes and did no poor work in constructing their line. Not a wire was broken down, nor was any other defect in the appliances developed. Telegraph-wires were down in every direction, and the telephone-wires of the city suffered great damage; but the wires on the Union Railway line stood the test without the slightest damage."

PROTECTING IRON AND STEEL BY ELECTROLYSIS. — The methods at present in use for the prevention of oxidation of steel and iron have all the same object, namely, the formation of a coating of magnetic oxide of iron; but all of them are more or less unsatisfactory. Considerable time is usually required, and there is no certainty that the protection will be perfect. M. de Méritens has been experimenting for some time on an electrolytic method of obtaining the same result, and has finally been successful. *Industries* describes the process as follows: "The article is exposed to a current of electricity in a bath consisting of ordinary water, or, better, of distilled water, heated to 70° or 80° C. The object to be coated is made the anode, while a strip of carbon, copper, or iron serves for the cathode; or, if an iron tank is used, the sides of the tank may form the cathode. The current should only have an electro-motive force slightly in excess of that required to decompose water, as too strong a current produces a pulverulent form of the oxide, which does not properly adhere; moreover, it has the inconvenience of eating into polished surfaces. The operation should be conducted in the same manner as electrotyping. In the course of a few minutes, black coloration appears on the article, and after one or two hours the coating of magnetic oxide of iron is of sufficient solidity to resist polishing. The coating is found to penetrate into the mass of the metal; for if the external portion be removed by means of emery, and the white under surface be again exposed in the bath, it becomes black again almost immediately, demonstrating that the effect of the first electrolyzing has affected the mass to some depth. When a piece of rusty iron is treated by the current in a warm-water bath in the manner described, the rust, consisting of ferric oxide, is completely converted into magnetic oxide. The exterior layers are not adhesive, but the interior coating is almost as hard as the metal itself. The best processes employed hitherto for coating steel goods require at least eight or ten days, and only imperfect results are obtained when applied to wrought or cast iron. De Méritens's process treats all sorts of iron and steel effectually in a few hours, requires no preliminary preparation, and can be applied as easily to rough as to polished surfaces. The coating is a brilliant black, is very hard, and it is difficult to attack it with lime; moreover, it is not easily wetted by water.

BOOK-REVIEWS.

On the Senses, Instincts, and Intelligence of Animals, with Special Reference to Insects. (The International Scientific Series, No. LXIV.) By Sir JOHN LUBBOCK. New York, Appleton. 8°.

SIR JOHN LUBBOCK'S varied, valuable, and interesting contributions to science have gained for him a high place among anthropologists and biologists as well as scientists in general. He is an eminent example of the union of ingenuity with painstaking compilation and wide observation that has distinguished so many